



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/986,008	11/07/2001	Takahiro Iijima	7565-110	4572

20582 7590 03/08/2004

JONES DAY  
51 Louisiana Aveue, N.W  
WASHINGTON, DC 20001-2113

EXAMINER

CHANG, RICK KILTAE

ART UNIT	PAPER NUMBER
----------	--------------

3729

DATE MAILED: 03/08/2004

2

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/986,008

Applicant(s)

IJIMA ET AL.

Examiner

Rick K. Chang

Art Unit

3729

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 January 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) that are not recited in item 6 below is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 14-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 09/288,114.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of Species 1 in Paper No. 5 is acknowledged.

### *Claim Objections*

2. Claim 16 is objected to as being a substantial duplicate of claim 14. Claim 16 contains the limitation disclosed in claim 14; therefore, they are essentially duplicates of one another or else are so close in content that they both cover the same thing, despite a slight difference in wording. It is improper to have two claims which contain the same limitations, in the same application as one claim would be a substantial duplicate of the other claim.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asai et al (US 6,240,636) in view of Abe (US 5,746,868), and further in view of Hanson (US 6,021,564) and Tamura et al (US 5,433,000).

Asai discloses in Fig. 1 the following: laminating 1 and 2 on 3 and 4; first removing copper (col. 1, lines 27-28) and then irradiating to remove 2; electroless plating and electro plating; acid etching; last figure 1 shows the plated hole is smaller than the wiring pattern; a cathode current density of 10-100 A/dm<sup>2</sup>; and electroless copper thickness is .1  $\mu$ m.

Asai fails to disclose forming a step portion of the resin substrate; covering the step portion with a conductor film; electro plating at a current of .1 to 2 A/dm<sup>2</sup>, especially .5 to 1.5 A/dm<sup>2</sup>; irradiating in the ultraviolet range; and providing 20 to 100 μm blind via diameter.

Abe discloses forming a step portion of the insulating substrate (Fig. 1C) and covering the step portion with a conductor film (Fig. 1E).

Hanson discloses providing 20 to 100 μm blind via diameter (col. 2, line 5).

Tamura discloses irradiating in the ultraviolet range (col. 3, line 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Asai by forming a step portion of the insulating substrate and covering the step portion with a conductor film, as taught by Abe, for the purpose of forming an interconnection pattern.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Asai by providing 20 to 100 μm blind via diameter, as taught by Hanson, for the purpose of forming more interconnections patterns in a small real estate, such as a printed circuit board.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Asai by irradiating in the ultraviolet range, as taught by Tamura, for the purpose of forming extremely small vias by utilizing extremely narrow frequency.

The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of electro plating current ranges (.1 to 2 A/dm<sup>2</sup>, especially .5 to 1.5 A/dm<sup>2</sup> and further 1 A/dm<sup>2</sup>) is the optimum combination of ranges. *Peterson, In re, 315 F.3d 1325, 65 USPQ2d 1379 (1/8/03).*

Art Unit: 3729

5. Claims 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asai et al (US 6,240,636) in view of Abe (US 5,746,868), and further in view of Lan et al (US 5,906,042), Tamura et al (US 5,433,000) and Reid (US 6,024,857).

Asai discloses in Fig. 1 the following: laminating 1 and 2 on 3 and 4; first removing copper (col. 1, lines 27-28) and then irradiating to remove 2; electroless plating and electro plating; acid etching; last figure 1 shows the plated hole is smaller than the wiring pattern; a cathode current density of 10-100 A/dm<sup>2</sup>; and electroless copper thickness is .1  $\mu$ m.

Asai fails to disclose forming a step portion of the resin substrate; covering the step portion with a conductor film; electro plating at a current of .1 to 2 A/dm<sup>2</sup>, especially .5 to 1.5 A/dm<sup>2</sup> and further 1 A/dm<sup>2</sup>; irradiating in the ultraviolet range; providing 20 to 100  $\mu$ m diameter and 20 to 100  $\mu$ m depth hole with the aspect ratio of .5 to 1.5; and electro plating faster in the hole than on the resin.

Abe discloses forming a step portion of the insulating substrate (Fig. 1C) and covering the step portion with a conductor film (Fig. 1E).

Lan discloses providing 20 to 100  $\mu$ m diameter and 20 to 100  $\mu$ m depth hole with the aspect ratio of .5 to 1.5 (col. 15, lines 28-29).

Tamura discloses irradiating in the ultraviolet range (col. 3, line 2).

Reid discloses electro plating faster in the hole than on the resin (col. 4, lines 45-46).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Asai by forming a step portion of the insulating substrate and covering the step portion with a conductor film, as taught by Abe, for the purpose of forming an interconnection pattern.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Asai by providing 20 to 100  $\mu\text{m}$  diameter and 20 to 100  $\mu\text{m}$  depth hole with the aspect ratio of .5 to 1.5, as taught by Lan, for the purpose of forming more interconnections patterns in a small real estate, such as a printed circuit board.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Asai by irradiating in the ultraviolet range, as taught by Tamura, for the purpose of forming extremely small vias by utilizing extremely narrow frequency.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Asai by electro plating faster in the hole than on the resin, as taught by Reid, for the purpose of filling the hole without voids to prevent delamination of circuits.

The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of electro plating current ranges (.1 to 2 A/dm<sup>2</sup>, especially .5 to 1.5 A/dm<sup>2</sup> and further 1 A/dm<sup>2</sup>) is the optimum combination of ranges. *Peterson, In re*, 315 F.3d 1325, 65 USPQ2d 1379 (1/8/03).

### ***Conclusion***

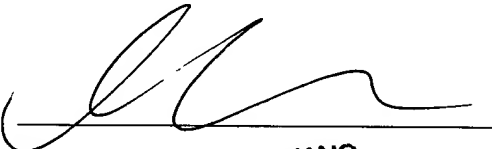
**6. Please provide reference numerals (either in parentheses next to the claimed limitation or in a table format with one column listing the claimed limitation and another column listing corresponding reference numerals in the remark section of the response to the Office Action) to all the claimed limitations as well as support in the disclosure for better clarity. Applicants are duly reminded that a full and proper response to this Office Action that includes any amendment to the claims and specification of the application as**

Art Unit: 3729

**originally filed requires that the applicant point out the support for any amendment made to the disclosure, including the claims. See 37 CFR 1.111 and MPEP 2163.06.**

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick K. Chang whose telephone number is (703) 308-4784. The examiner can normally be reached on 5:30 AM to 1:30 PM, Monday through Thursday.

The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9302 for regular communications and (703) 872-9303 for After Final communications.



**RICHARD CHANG  
PRIMARY EXAMINER**

RC  
March 4, 2004